

Effects of Seasons and Sociological Variables on Suicidal Behavior

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INVESTIGATORS HAVE BEEN SPECULATING for years as to the possible association between the monthly and seasonal distribution of completed and attempted suicides (1-3). Moreover, despite numerous statistical studies and reports on the subject, a consistent relationship between variations in the frequency of suicide, attempted suicide, and temporal factors has not been established. The subject remains moot.

Although there may not be a direct causal relationship, it is conceivable that some temporal factors could precipitate the act by a potentially suicidal person. To my knowledge, the social science literature contains no reports of studies that considered seasonal variations in completed and attempted suicides among specific subgroups of the population according to sex, race, age, marital status, and occupation.

Studies of committed suicide generally conclude that it follows a certain rhythm with seasonal changes. The most consistent generalization over the years has been that the maximum incidence occurs during spring and summer. According to Durkheim (1a):

Neither in winter nor in autumn does suicide reach its maximum, but during the season when nature is most smiling and the temperature mildest. . . . If the year is divided into two halves representing respectively the six warmest months (March to August) and the six coldest, the former always include more suicide. Not one country is an exception to this.

From his study of the monthly distribution of suicides in American cities, Miner (4) concluded that the "maximum frequency of suicide occurs in May or June, the minimum in December." He conceived this pattern to be "an effect of the weather."

More recent reports also acknowledge a seasonal variation in suicide rates—the highest occurring in spring and summer (5,6). Maris (6) found for Cook County, Ill., that the seasons ranked, in order of decreasing frequency of suicide, spring, summer, fall, and winter. However, Shneidman and Farberow (7)

found no significant temporal variations by month.

In the United States, Dublin (2a) noted that the peak in suicides occurs in May or April and the low in December. However, there are often subsidiary peaks. For example, in 1960 (2b) and in 1964 (8) a subsidiary peak occurred in October.

A few investigators noted a temporal pattern in the incidence of attempted suicide. Whitlock and Schapira (9) reported more attempted suicides in the last 6 months of the year than in the first 6 months. Schmid and Van Arsdol (10) found that the maximal month was July and the minimal was October.

On the other hand, several other investigators found no seasonal variation in attempted suicide. Shneidman and Farberow (7) saw no significant variation in the timing of suicide attempts by season. In a comparison of 1,817 suicide attempts by white and nonwhite persons from 1927 to 1936, Piker (11) found little conformity regarding the months of greatest and least frequency. For white males, the greatest number of attempts occurred in January, followed by November, August, and December. The greatest number of attempts for white females occurred in August, followed by June, September, and May. Piker's data indicate that suicide attempts by white males are more likely during the colder months, whereas for white females they are more likely in the 3 warmer months. For nonwhite females, attempts were most frequent in September, April, October, and May—a high autumn and spring incidence. For nonwhite males, the difference in incidence of attempts by month and season was not significant.

Thus, as revealed by the preceding studies, some investigators have found that variation does occur

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by month and season, but others found no patterns in seasonal variation and suicidal activity. Therefore, it is difficult to ascertain reliable trends.

The Present Study

This investigation concerned the possible relationships between the timing of completed suicide, attempted suicide, and the sociological variables of sex, race, age, marital status, and occupation. Although it is not possible to investigate each association between seasonality and suicidal behavior—that is, completed and attempted suicide—seasonal changes and their effects on social roles are important toward gaining a better understanding of the nature of suicide phenomena.

There were two areas of concern in this study. First, in considering the seasonality of mortality, one should study a long-enough timespan to permit analysis of reliable patterns and trends because completed suicide occurs infrequently among many social categories—for example, sex, race, and marital status groups. A particular problem in the study of suicide over time is the possible change in definitions and classifications. Although most studies have employed an operational definition of the act, that is, reporting and recording by the appropriate authority as suicide or attempted suicide, some investigators have framed more detailed definitions in terms of their basic methodological or philosophical presuppositions (12).

The second concern was the complete identification and enumeration of suicide and attempted suicide populations. Potential sources of error and efforts at concealment of the cause of the death or the attempt have been discussed in the literature, but little evidence is available on the exact extent of the existence of a selective process that results in under-reporting of cases (13). This lack of complete information dilutes the accuracy of statistical interpretations and casts some doubt on the conclusions that may be derived from such material.

Study Method and Source of Data

Reports of 637 deaths by suicide from 1965 through 1974 in Flint, Mich., were obtained from death certificates and police records. The total number of attempted suicides from 1970 through 1974 was 2,942. The figures on "attempts" are cases recorded by the police, public and private hospitals, and information supplied by physicians. The data for the completed and attempted suicides were collected and tabulated for statistical analysis. The monthly and seasonal variations of suicidal acts were analyzed for the total completed and attempted suicides and by

race, age, sex, and marital status; for occupation, only seasonal variations were examined.

Results

A comparison of chance expectations by the chi-square test of significance on the distribution of completed and attempted suicides by months and seasons showed significant differences between the observed and expected frequencies—that is, the means for all months and seasons. The probability for the actual distribution of suicides for months and seasons was $\chi^2 = 19.61$, $df = 2$, $P < .001$, and for suicide attempts it was $\chi^2 = 4.81$, $df = 2$, $P < .05$.

As shown in table 1, the greatest number of suicides and attempted suicides occurred in December. The lowest number of suicides occurred in September and of attempted suicides in August. The data in the table contradict the popular reference to November as "hangmonth." By season, most of the suicides and attempts in Flint occurred in winter, the fewest

Table 1. Percentage distribution of 637 suicides and 2,942 attempts, by season and month

Season and month	Percent
	<i>Suicides</i> ¹
Spring (N = 169)	26.5
March	6.6
April	9.5
May	10.4
Summer (N = 152)	23.9
June	10.7
July	6.2
August	7.0
Fall (N = 127)	19.9
September	4.6
October	8.2
November	7.1
Winter (N = 189)	29.7
December	13.3
January	9.4
February	7.0
	<i>Attempts</i> ²
Spring (N = 746)	25.3
March	8.1
April	7.8
May	9.4
Summer (N = 649)	22.1
June	8.6
July	7.0
August	6.5
Fall (N = 709)	23.8
September	7.9
October	7.1
November	8.8
Winter (N = 847)	28.8
December	11.1
January	9.3
February	8.4

¹ $P < .001$

² $P < .05$

suicides in fall, and the fewest attempts in summer and fall.

Although there are some significant differences in the incidence of completed and attempted suicide by season and month, it is not likely that these differences are the result of dramatic changes in temperature. For instance, the incidence of suicide and attempted suicide is high in December and May. However, despite the differences in temperatures in these months, the incidence of suicide and attempted suicide is relatively constant.

A ranking from high to low of monthly suicides and attempts for Flint and Kalamazoo showed no evidence that temperature is causally associated with suicidal activity (table 2). In Flint, May and June ranked high in completed and attempted suicide, but July ranked low. In fact, according to the data in table 2, completed and attempted suicide and tem-

perature have no consistent relationship; thus, one cannot assume that they are causally related.

A comparison of original data from several studies with our findings showed widely observed differences in maximum-minimum frequencies of suicide by month and season (table 3). In 4 of 10 cities, suicide occurred more frequently during the winter months. The data in table 3, at least, do support broad generalizations as to the season selected most frequently for suicide, but there is great variability as to the month.

If a seasonal variation does exist in completed and attempted suicide, it may be that it exists to a greater extent among certain population subgroups—males and females, different age groups, racial groups, marital status groups, and occupational groups, as evidenced in table 4.

Sex. For both suicides and attempted suicides, the maximum frequency of occurrence is in winter. Table 4 shows the largest percentage of suicide for females and attempted suicide for males and females in winter. The lowest frequency of suicide for males and females is in the fall, but it is in the summer for attempts. The next lowest suicide frequency for males and females is in the summer, and for attempts by males and females it is in the fall.

If all suicides and attempts reported in the present study are divided by occurrence in cold and warm months, 55.6 percent of the suicides of males and 46.7 percent of those by females occurred in the warmer months (spring and summer) compared to 42.7 percent of the attempts by males and 46.0 percent of the attempts by females. The seasonal difference in distribution between the sexes and between completed and attempted suicides is statistically significant.

Table 2. Rank of completed and attempted suicide frequency, by month, Flint and Kalamazoo, Mich.

Month	Flint, 1965-74		Kalamazoo, 1960-69 ¹	
	Suicides	Attempts	Suicides	Attempts
January	5	3	5	2
February	9	6	7	7
March	10	7	10	6
April	4	9	6	8
May	3	2	4	4
June	2	5	2	5
July	11	11	9	10
August	8	12	8	11
September	12	8	12	12
October	6	10	3	9
November	7	4	11	3
December	1	1	1	1

¹ Unpublished data. NOTE: 1 is high, 12 is low.

Table 3. Seasonal distribution of suicides in selected cities

City and reference No.	Summer	Spring	Fall	Winter	Maximum month	Minimum month
Chicago, 1919-25 (14)	35.0	21.0	13.0	31.0	December	January
Chicago, 1959-63 (6)	25.0	28.0	24.0	23.0	March/May	November/January
Minneapolis, 1928-38 (15)	34.0	16.0	13.0	35.0	May	July
Seattle, 1914-25 (16)	33.0	19.0	16.0	32.0	October	August
Seattle, 1948-52 (10)	29.0	17.0	15.0	39.0	November	October
San Francisco, 1938-42 (5a)	32.0	26.0	26.0	34.0	January	December
San Francisco, 1948-52 (5a)	35.0	25.0	22.0	34.0	August	September
Philadelphia, 1948-52 (17)	30.0	21.0	15.0	34.0	March	November
Kalamazoo, 1960-69 ¹	34.0	25.0	24.0	17.0	December	September
Flint, 1965-74	24.0	27.0	20.0	30.0	December	September

¹ Wenz, F.: Suicide and attempted suicide, 1969; unpublished.

Table 4. Percentage distribution of suicides and attempted suicides, by season, sex, race, age groups, and marital status

Season	Suicides		Attempts		
	Male (N=485)	Female (N=152)	Male (N=715)	Female (N=2,227)	
Spring	31.2	27.6	23.1	25.1	
Summer ...	24.4	19.1	19.6	20.9	
Fall	19.2	15.8	22.7	24.2	
Winter	25.2	37.5	34.7	29.9	
		$X^2=8.1, df=2, P<.01$		$X^2=28.32, df=2, P<.001$	
Season	White (N=505)	Nonwhite (N=132)	White (N=2,190)	Nonwhite (N=752)	
Spring	31.2	20.5	26.0	32.7	
Summer ...	26.5	13.6	17.8	26.7	
Fall	18.2	26.5	24.4	22.1	
Winter	24.1	39.4	32.8	18.5	
		$X^2=21.38, df=2, P<.001$		$X^2=6.97, df=2, P<.05$	
Season	Under 45 years (N=147)	Over 45 years (N=490)	Under 45 years (N=1,894)	Over 45 years (N=1,048)	
Spring	22.4	25.5	16.7	22.4	
Summer ...	31.3	20.8	33.1	14.8	
Fall	18.5	19.0	20.5	27.6	
Winter	27.8	34.7	29.7	35.2	
		$X^2=5.1, df=2, P<.07$		$X^2=6.31, df=2, P<.01$	
Season	Married (N=418)	Unmarried (N=219)	Married (N=1,116)	Unmarried (N=1,826)	
Spring	20.7	33.8	19.5	30.9	
Summer ...	27.6	16.5	25.3	19.2	
Fall	23.2	20.7	22.0	24.9	
Winter	28.5	29.0	33.2	25.0	
		$X^2=4.72, df=2, P<.05$		$X^2=12.18, df=2, P<.001$	

Race. Spring is the favorite season for suicide among white persons, and winter is favored by nonwhite persons (table 4). On the other hand, fall is the lowest season for suicides by whites and summer for nonwhites. The attempts show an opposite pattern: for white persons the maximum frequency is in winter, and for nonwhite persons it is in spring. Winter is the preferred season for suicide by nonwhite persons and for white persons to attempt suicide, while spring is favored for suicide by white persons and nonwhite persons to attempt suicide. In fact, of the 637 cases of suicide over the 10-year period, 57.7 percent of the suicides by whites and 44.1 percent of those by nonwhites occurred in the warmer seasons. However, the percentages are reversed for suicide attempts—43.8 percent for whites and 59.4 percent for nonwhites in spring and summer. The finding for

nonwhites partly confirms Piker's report of a greater number of suicide attempts in spring (11).

Age groups. In addition to their seasonal distribution, suicide and suicide attempts also may be considered according to specific age groups (table 4).

The seasons for the maximum and minimum frequencies of suicide are the same for both the under 45 and over 45 age groups. For the under 45 group, the highest frequency for completed and attempted suicide occurs in summer; but for those over age 45, it occurs in winter. For both age groups the lowest suicide frequency occurs in fall, and for attempted suicide it occurs in spring. The under 45 age group commits more suicide in the warmer seasons (53.7 percent). On the contrary, the majority of the under 45 (51.0 percent) and the over 45 age groups (62.8 percent) attempt suicide in the colder seasons.

Marital status. Another seasonal association is revealed when all suicides and attempted suicides are divided by seasonal occurrence into married and unmarried categories (table 4).

For married persons the maximum frequencies of suicide occur in winter and summer, and for the unmarried they occur in spring and winter. For the married the greatest number of attempts also occur in winter, but the least number occur in summer for the unmarried. The unmarried have the largest percentage of suicide (33.8) and attempted suicide (30.9) in the spring, but the married have the largest percentage of suicide (28.5) and attempted suicide (33.2) in the winter (table 4). The overall seasonal pattern of suicide and attempts in Flint differed significantly from that to be expected by accidental distribution.

Occupation. That suicide varies with occupation has long been known. However, this relationship has not been examined in depth because of inadequate and unreliable information on occupational background in public records and the recording of occupation under a unified system of classification. For this reason, two general occupational categories were used in this study, and the results are presented in table 5.

No significant difference exists between groups 1 and 2 for summer, but significant differences can be seen for the other seasons (table 5). For group 1 (white-collar workers) the maximum-minimum frequencies are in spring and winter, and for group 2 (blue-collar workers) they are in winter, fall, and summer. The greatest frequency (54.6 percent) was recorded in the colder season for group 2, but for

Table 5. Percentage distribution of suicides, by season and occupational groups

Season	Group 1 ¹ (N=192)	Group 2 ² (N=312)	Total ³ (N=504)
Spring	38.6	25.3	31.9
Summer	19.6	20.1	19.7
Fall	26.0	21.8	23.9
Winter	15.8	32.8	24.3

¹ Includes the professional, technical, managers, administrators, sales, and craftsmen categories used in the 1970 census.

² Includes clerical, operatives, transporters, laborers, service workers, farmworkers, and domestics.

³ Information on occupation was available for 608 of the 637 persons who committed suicide; 104 of the 608 were students or housewives, and no occupation was recorded for 29 of the total 637.

group 1 it was in the warmer season (58.2 percent).

If temperature does not produce temporal variations in the frequency of suicide by occupational groups, what does? The special social and economic circumstances of the month and season may account for the greater incidence of suicide during some seasons of the year; this seems especially true in spring for group 1 and in winter for group 2. Occupation is an important factor not only because of the kind of work involved, but also because of the way life outside of work followed by persons in particular occupations.

Discussion and Conclusion

The results of this study indicate, seasonally, that most suicides and attempts occur in winter, the fewest suicides in fall, and the fewest attempts in summer and fall. The following generalizations also emerged from this study:

Sex: Females commit more suicide in winter, and males commit more suicide in spring. For attempted suicide, the frequency is greatest in winter for both males and females.

Race: Whites commit more suicide in spring and nonwhites in winter. The maximum frequency for attempts is in winter for whites and in spring for nonwhites.

Age: For the under 45 age group, the greatest numbers of completed and attempted suicides occur in summer. For those over age 45, the greatest numbers occur in winter.

Marital status: Married persons commit more suicide in winter and summer and unmarried persons in spring and winter. The greatest number of attempts occur in winter for the married.

Occupation: Blue-collar workers commit more suicide in winter and white-collar workers in spring.

These generalizations lead one to wonder how can they be explained. Durkheim contended that the fluctuation of the suicide rate with seasons of the year could not be affected by climate and seasonal temperature, because the same climate and temperature may produce a high suicide rate at another time and place. To quote Durkheim (1b):

If voluntary deaths are more numerous from January to July, it is not because waves of heat exert disturbing influence on the organism, it is because social life is more intense. If it acquires this intensity, it is because the position of the sun, the condition of the atmosphere, permit it to develop more easily than during the winter.

Durkheim's basic hypotheses are: (a) beginning with January, the incidence of suicide increases regularly from month to month until June, regularly decreases from that time to the end of the year, and reaches its lowest point in January (1c) and (b) the greatest to the smallest numbers of suicides occur in the following seasonal order: summer, spring, fall, and winter (1d). Neither of these hypotheses is supported by our data. Table 1 shows that suicide decreases from December to March, increases from April to June, and occurs irregularly from July to November. The pattern for attempted suicide is similar to the pattern for suicide.

From his study of the monthly distribution of suicides in American cities, Miner (4) concluded that "the maximum frequency of suicide occurs in May or June, the minimum in December or January." Dublin (2) disclosed a similar pattern for the United States—the peak for suicide is in April or May and the low in December. If the Miner-Dublin-Durkheim conclusions are taken as the norm, the monthly frequency in Flint must be considered atypical. As tables 1 and 2 indicate, the maximum frequency was in December and the minimum in September. However, an examination of suicide studies in several other American cities (table 3) revealed that the Miner-Dublin-Durkheim rule is violated in many instances.

The findings of several European studies seem more consistent with the pattern of monthly distribution of suicide observed by Miner, Dublin, and Durkheim. Mayr (18) noted that the distributions, by month, of suicides in 12 nations formed a curve, rising in May and declining as August approached. If temperature is the basic cause of the timing of suicide and attempted suicide, then they should vary with temperature. In other words, countries with similar temperatures should have similar rates of suicide and attempted suicide. The most famous refutation of this hypothesis is what Hendin (19)

calls the "Scandinavian suicide phenomenon," that is, the high suicide rates in Sweden and Denmark and the low rate in Norway.

In view of the widely observed differences with respect to maximum-minimum frequencies of suicide (and attempts) by month and season, it is safe to state that neither the Flint data nor data published from other studies reveal fully consistent patterns of the monthly and seasonal distribution of suicidal acts.

To provide an adequate interpretation of the seasonal patterns in completed and attempted suicide observed in the present study, and in others, many factors must be considered, some of which are the variables of sex, age, race, marital status, and occupation. Furthermore, it would be of interest to know more about the wide range of cultural and social forces operating on these variables that may precipitate suicidal acts.

Sex differentials in suicide and attempted suicide have been explained in terms of status roles that traditionally put men under greater stress and create possibilities for personal maladjustment. Men supposedly have learned to strive in society to satisfy their needs and aspirations. When situations are radically changed in the society, conditions for self-destruction are increased. Emotional differences between the sexes also have been advanced as an explanation of sex differentials in the rates. Yet, how climatic and seasonal variables affect sex roles and eventual suicidal behavior remains unclear. Durkheim (1), for example, mentioned that men are more likely to abandon their lives in summer, implying that hot weather provokes or aggravates suicidal tendencies. He felt that the explanation lay in the variation in social activities during different seasons.

Research has shown that completed and attempted suicide rates correspond to age; the suicide risk increases as chronological age increases, but the reverse is true for attempted suicide. It should be pointed out that age is not the determining factor in suicidal tendencies. To chronological age must be added the social and cultural factors that influence suicide potential. Social factors have greater causal importance than biological or possibly seasonal factors in the explanation of high suicide and attempted suicide rates among various age groups.

Marital status differences exist in completed and attempted suicide. Explanations for differences in the rates have been given in terms of family cohesion, social participation, and psychological adjustment. Similarly, racial differences in rates of suicidal behavior have been explained in terms of aggres-

sion, guilt, social class variables, status integration, subcultural factors, and family integration.

It is clear that there are significant associations between such variables as sex, race, and age and suicidal behavior. There is scant evidence, however, for the claim of an association between social roles and suicidal behavior with the seasons.

The "seasonal" theories of suicide by Durkheim, Dublin, and Miner (1,2,4) largely concerned the description of the suicide rate of a population in different seasons of the year, and there is some justification for this. A somewhat different explanation may be developed with the introduction of the concept of depression as a mediating variable between season, social roles, and suicidal behavior.

The percentage of people who committed suicide and who had been diagnosed as mentally depressed has been reported to range from 62 to 92 percent (20). However, the percentage of people with depression who commit suicide has been reported to range from 10 to 50 percent (21). A seasonal variation and correlation between climatic changes and depression has also been reported. Kraines (22) observed two peaks during the year, in March and September, for the time of onset of depression episodes. But a relationship between season, depression, and suicide is not consistent with our finding that the incidence of completed and attempted suicides is low to moderately low in March and September (table 1).

There is reason to believe that the relationship between season, social roles, and suicidal behavior is mediated by the psychological factor of depression. It would be interesting to speculate on the following causal factors:

- Depression is seasonal and peaks in March and September, or some other months.
- A person with a given configuration of social roles—for example, male, widowed, aged, white, poor work role—is more susceptible to depression.
- The depressed person attempts to deal with depression for 2 to 3 months.
- After a few months, the person can no longer cope with the frustration and stresses of his social roles and thus attempts or commits suicide.
- Depression that peaks in March continues into May, and that which peaks in September continues into December.

Another explanation for our results may be in order. Some investigators suggest that there are seasonal effects on those people who intend to attempt or commit suicide but postpone these acts in order to participate in seasonal ceremonies or rituals. Phillips and Feldman (23) reported that people con-

templating suicide generally do not carry out the act before their birthdays or political, domestic, or religious ceremonies. Similarly, Blachly and Fairly (24) tested the hypothesis to determine whether more suicides occur on holidays than at other times. Although they found high suicide rates for some holidays and low rates for others, the suicide rate for all holidays was not significantly different from that for the total year. An important factor in the explanation of our findings may be that certain annual ceremonies or certain days of the year have special meanings and emotional involvement for all people, regardless of sex, marital status, race, age, or occupation.

In American society, people value cultural ceremonies and holidays differently. Traditionally, men have been more interested in sports and politics, and women have been more interested in religion and the arts. Do men produce a larger "suicide dip" and women a larger "attempted suicide dip" before certain seasonal events? What about those ceremonies that interest the old but not the young? Is the postponement of suicide or attempted suicide the reason for variations in suicidal activity by season?

Is there a theoretical and empirical linkage between annual events—such as Easter, Memorial Day, or the Fourth of July—depression, social roles, and suicidal acts? Many people representing all race, sex and age, marital status, and occupational groups experience depression during the Christmas season. For instance, among the middle aged, Christmas is a reminder that life is not what it was when people were less affluent and mobile. Among those who tend to experience depression are widows and widowers who think of Christmas as an anniversary of their spouses' deaths and renew the grieving process. For others, the many pressures of the holidays—family, social, and economic—combine to make the season the most explosive time. Customarily, at holiday times people audit their lives. And, for some, the gap between what they believe should be and what is leads them to suicidal behavior.

In conclusion, two approaches are most promising for pursuing the possible seasonal effect on suicidal behavior: (a) the effect of the seasons on depression, social roles, and suicidal acts and (b) the effects of ceremonial occasions, social roles, and temporal variations in suicidal acts. In the final analysis, however, it may be that completed and attempted suicide show a possible annual rhythm that sometimes results in a seasonal pattern. Moreover, seasonal variations in suicidal acts may not necessarily reflect variations in seasonal, sociological, and psychological

variables, but the heterogeneous etiology of completed and attempted suicide. As Dublin remarked (2a):

We do not know whether seasonal variation in suicide results from the undiscovered physiological responses to changes in temperatures, humidity or other natural conditions, or whether it is due to the restlessness of "spring fever" or to the painful contrasts between the suicide's own despair and the resurgence of life about him.

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